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Aims Fourteen Dutch heart centres collected patient-relevant outcomes to support quality improvements in a value-based healthcare initiative that began in 2012. This study aimed to evaluate the current state of outcome-based quality improvement within six of these Dutch heart centres.

Methods and results Interviews and questionnaires among physicians and healthcare professionals in the heart centres were combined in a mixed-methods approach. The analysis indicates that the predominant focus of the heart centres is on the actual monitoring of outcomes. A systematic approach for the identification of improvement potential and the selection and implementation of improvement initiatives is lacking. The organizational context for outcome-based quality improvement is similar in the six heart centres.

Conclusion Although these heart centres in the Netherlands measure health outcomes for the majority of cardiac diseases, the actual use of these outcomes to improve quality of care remains limited. The main barriers are limitations regarding (i) data infrastructure, (ii) a systematic approach for the identification of improvement potential and the selection and implementation of improvement initiatives, (iii) governance in which roles and responsibilities of physicians regarding outcome improvement are formalized, and (iv) implementation of outcomes within hospital strategy, policy documents, and the planning and control cycle.

Keywords Value-based healthcare • Quality improvement • Outcome measures • Patient value • Qualitative study

Introduction

Internationally, healthcare providers are transforming into more value-driven care organizations with the implementation of value-based healthcare (VBHC).[1] The first step in implementing VBHC is to measure and improve outcomes.[1] To support outcome measurement, several standard sets of outcome measures have been

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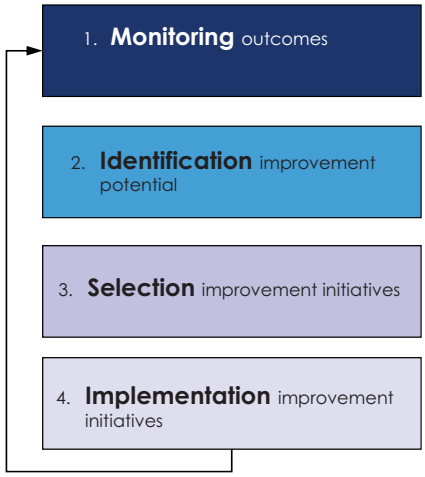

Element	Short description
1. Strategy	How is outcome-based quality improvement embedded in strategy, policy documents, and planning & control?
2. Governance (structure)	How is outcome-based quality improvement embedded in governance?
3. Culture (shared values)	To what extent is outcome-based quality improvement part of the organizational culture?
4. Leadership (style)	To what extent does formal or informal leadership embrace and stimulate outcome-based quality improvement?
5. Infrastructure (systems)	To what extent does IT infrastructure support outcome-based quality improvement ?
6. Staff	To what extent is dedicated staff available (physician, support staff) to support outcome-based quality improvement?
7. Skills	What skills are available in the organization to support outcome-based quality improvement?

Figure 1 The outcome-based improvement cycle (left) and an adapted version of the 7S model of McKinsey (right) to study the organizational context in which outcome measures are used.

developed in recent years.[2–5] However, little is known on how to use these insights into outcomes to drive improvement of patient value.[6]

In 2012, a VBHC project was initiated for cardiac diseases in the Netherlands leading to publications of patient-relevant outcomes, including short- and long-term survivals, complications, re-operations, and quality of life.[7,8] By 2016, 14 heart centres had voluntarily joined this initiative. In 2017, the Netherlands Heart Registry (NHR) was founded, merging this initiative with the national registries of cardiology and cardiothoracic surgery. The annual public report in 2018 included outcomes of different treatment options for coronary artery disease, aortic valve disease, atrial fibrillation, and mitral valve disease, containing data for ~80 000 new patients annually.[9,10]

Public benchmarking of outcomes has led to several improvement initiatives.[11–13] However, the structural embedment of outcomes within the organization and in quality management programmes is a prerequisite for long-term successful quality improvement.[14–16]

In order to evaluate the current state of outcome-based quality improvement, a study was initiated in six of these Dutch heart centres. The focus was two-fold: firstly, we looked at how insights into outcomes drive quality improvement initiatives, and secondly, how outcome-based quality improvement is embedded in the organization.

Methods

Framework

Two models were used to study outcome-based quality improvement in the six heart centres. The *outcome-based improvement cycle* (left part of *Figure 1*) was used to investigate how insight into health outcomes drives quality improvement initiatives. This model is related to the Plan-Do-Study-Act (PDSA) model, which is explained in Supplementary material online, *Table S1*.[17] The 7S model of McKinsey was used to study the organizational context in which outcome measures were used.[18] This model was adapted to focus specifically on health outcomes (right part of *Figure 1*).

All centres involved in the 2016 VBHC initiative were invited to participate in the project. Of these, six heart centres accepted the invitation to participate. Apart from their motivation to join, these six heart centres had an average level of participation in the outcome registration (data completeness and years of participation).

Design

A mixed-methods approach was applied. Data were collected through questionnaires and semi-structured interviews conducted in parallel. Results were validated in group meetings at each participating heart centre. Methodological triangulation was used to study the status of outcome-based quality improvements in each of these centres and to reach validity, combining questionnaires with interviews.

The full study took 12 months, from September 2016 until September 2017. At each heart centre, three local group meetings were organized: a kick-off meeting, a meeting to discuss the first insights, and a final meeting to discuss and validate the results. Participants were selected to ensure a good representation of each heart centre, resulting in the inclusion of at least one cardiologist, one cardiothoracic surgeon, managers of the heart centre (medical and non-medical), and a data analyst. The questionnaire was based on the models and steps shown in *Figure 1* (Supplementary material online, *Table S2*). In total, 42 detailed questions were posed in the steps of the combined model.

The questionnaire was sent to each centre using an online survey tool. The group members of each heart centre filled out the questionnaire together. For each heart centre, 6–8 separate interviews were conducted. In addition to the selected participants, a member of the hospital board of directors was also interviewed. In total, 41 semi-structured interviews were conducted of ~45–60 min each. An interview guide was used, based on the model in Exhibit 1. For each of the themes in the model, open questions were developed, and probing questions were asked to obtain more detailed information.[18]

The interviews were conducted face to face by two researchers. Both researchers participated in each interview. For each of the interviews, detailed minutes were taken by the two researchers independently. The minutes were coded and analysed in Atlas.ti 8.2 using a thematic analysis

Table 1 Status of implementation of outcome-based improvement within six Dutch heart centres

	Themes
Outcome-based improvement cycle	
1. Monitoring outcomes	a. Monitoring of outcomes is more developed within cardiothoracic surgery, compared with cardiology (more data, more frequent discussions, and use of more advanced data analysis).
	b. Focus is on hard clinical outcomes. Insight in and use of Patient Reported Outcome Measures (PROMs) including quality of life is limited.
	c. Interpretation of outcome data is mainly an activity initiated by individual physicians.
	d. Outcomes are typically monitored and discussed in between quarterly and annually for the majority of heart diseases.
	e. The national benchmarking systems are the main tools for monitoring outcomes.
	f. Continuous real-time insight in and monitoring of outcomes has not been realized.
2. Identification improvement potential	a. No targets are set on available outcome measures.
	b. Performance on outcomes only leads to improvement initiatives if the hospital significantly underperforms with respect to the average in a national benchmark (after risk correction) or if a negative trend in time is observed.
	c. Differences in outcomes between individual surgeons are monitored and discussed. Within some centres, this performance is part of a formal assessment of individual surgeons.
	d. Several outcome measures have been selected where the heart centres aim to improve.
	e. The outcome reports in 2015 and 2016 have led to 1–4 improvement initiatives per hospital.
	f. Improvement projects are more often driven by incidents, calamities, and complication meetings (i.e. related to individual patients) and not by outcome reports (i.e. related to performance for all patients with a specific medical condition).
3. Selection of improvement initiatives	a. A systematic approach (method) to select improvement initiatives is lacking.
	b. No standard organizational structure exists for improvement projects.
	c. Improvement initiatives are mostly *ad hoc*.
	d. Improvement initiatives are mostly based on internal analyses. Outcome performance or benchmarking hardly ever leads to hospitals contacting each other to learn from one another.
	e. Outcome reports lead to additional in depth data analyses.
4. Implementation improvement initiatives	a. A systematic approach to implement and evaluate improvement initiatives is lacking.
Organizational context	
1. Strategy	a. Quality is often part of key elements in the defined strategy.
	b. Quality is often not well defined and is limited to high-level definitions in the strategy.
	c. Outcome performance hardly plays a role in the strategy and yearly policy documents.
	d. Steering on required quality indicators (e.g. by the Health Care Inspectorate) and steering on outcomes at medical condition level are often separate worlds (discussed, analysed, and reported in different meetings at different levels in the organization).
	e. In some hospitals physician income has been coupled for a small percentage to steering on outcomes (e.g. participation in VBHC projects).
2. Governance	a. The initiative for measuring and improving outcomes comes from physicians. Hospital management supports this trend, but does not initiate this.
	b. The heart centres have a multidisciplinary organizational structure. However, quality improvement and steering on outcomes is dominantly organized within the individual specialties.
	c. Multidisciplinary meetings are organized to discuss outcomes.
	d. Clinical outcomes are only discussed within the hospital and not with general practitioners or referring hospitals. Nurses and patients are not involved in discussing clinical outcomes.
	e. Roles and responsibilities regarding outcome performance have not been formalized.
	f. Reporting and discussion of outcomes at the level of the board of directors is limited and focuses on general outcomes (Hospital Standardized Mortality Ratio, complications) that are required by external parties (such as the Health Care Inspectorate). Outcomes at the medical condition level remain most of the time at lower levels in the organization.
3. Culture	a. A culture exists to openly discuss outcomes within each specialty. Much less openness exists to discuss outcomes between specialties.
	b. A culture exists to continuously improve healthcare.
	c. It is unclear whether strong support for outcome-based quality improvement exists. Opinions on this highly differ within and between individual hospitals.
	d. A large group of healthcare professionals are not actively informed on the outcomes and are not involved in discussions of the outcome data (physicians and nurses).

Continued

Table I *Continued*

	Themes
4. Leadership	a. Strong medical leadership to develop the outcome-based quality improvement cycle exists within the centres.
5. Infrastructure	a. Data infrastructure, data management, and acquiring high-quality data are seen as one of the largest barriers to realize outcome-based improvements.
	b. Structural out-of-hospital follow-up data collection processes are under construction.
	c. Extraction and visualization of outcomes require significant man hours (business intelligence, data analysts), this is not automated and data comes from several different sources.
	d. Hospitals are working on the development of quality dashboards. Dashboards exist in some hospitals, but in all hospitals this is work in progress.
	e. Most hospitals recently transitioned to a new Electronic Hospital Record (EPIC or HiX) or were planning to do so. Most hospitals are experiencing difficulty in this transition phase in extraction data needed to calculate and report on outcomes.
6. Staff	a. Physicians have no or limited dedicated time to discuss and analyse outcome data (evening hours).
7. Skills	a. The basic expertize to measure and analyse outcome data are available.
	b. In some hospitals, physicians have received training in VBHC and/or steering on outcomes.

with a deductive approach.[19] The study results are presented as a list of themes in which the findings from the interviews and the questionnaires are combined. Triangulation of the two data sources across the identified themes was conducted to demonstrate alignment or consistency between the sources.

Results

The main results of this study are presented in *Table 1*, categorized within the four steps of the outcome-based improvement cycle and the seven elements of the organizational context.

Outcome-based improvement cycle

The predominant focus of the heart centres is on the monitoring of outcomes (Step 1). A systematic approach for the identification of improvement potential, and the selection and implementation of improvement initiatives is lacking (Steps 2–4). Physicians explicitly mentioned that they struggle with this. For example, one centre had a significantly higher rate of wound infections compared to the national average. The urgency to improve was felt, but the cause of the poor performance was not identified and a systematic approach toward improvement was lacking.

Benchmarking of outcomes with other hospitals in the yearly NHR reports is the dominant manner in which outcomes are used to identify improvement potential. Typically, only being a statistically significant outlier with respect to the national average leads to improvement initiatives. In general, improvement initiatives arise more often from incidents, calamities, and complication meetings than from monitoring of outcomes.

Organizational context (1): strategy

Quality performance and improvement was mentioned by all participants as part of the hospital strategy. However, none of the centres has defined measurable goals, and outcome performance does not play a significant role in the planning and control cycle. Steering on mandatory quality indicators, as required by the Health Care Inspectorate or health insurance companies, takes precedence over steering on outcomes at the medical condition level. The centres differ in their approach to using outcome measures in their strategy. One centre states endeavours to monitor outcomes for all cardiac care and to achieve steady annual improvements in outcome measures. Another centre defined focus areas (i.e. aortic valve disease) in which the centre aims to outperform with respect to the top five in a national benchmark on a number of specific outcome measures. A third centre aspires to monitor outcomes without setting targets on the outcomes themselves but instead on the implementation of outcome-based improvement initiatives as a process measure.

Organizational context (2): governance

Independent of whether the physicians are employees or organized in physicians units, the roles and responsibilities regarding outcome performance have yet to be formalized. Outcome performance and improvement is partially discussed within specialties (the doctor's unit 'cardiothoracic surgery'), partially appropriated by initiatives from individual physicians and partially in project teams (e.g. anaesthesiologists, cardiologists, and cardiothoracic surgeons within a multidisciplinary team on quality improvement). Physicians taking initiative either individually or within project teams generally do not enjoy a formal mandate within the organization. However, in most centres in-hospital multidisciplinary meetings are organized to discuss outcomes. Referring cardiologists, nurses, or general practitioners are not involved, leaving part of the cycle of care uncovered.

Organizational context (3): culture

A culture exists to openly discuss outcomes within each specialty, but less openness exists to discuss outcomes in a multidisciplinary

setting. Although the culture within the six hospitals seems to support continuous quality improvement, it is unclear whether strong support for *outcome-based* quality improvement exists. Opinions on this differ greatly within and between the six hospitals. A large group of healthcare professionals (including both physicians and nurses) is not actively informed on the outcomes and is not involved in discussions of the outcome data.

Organizational context (4): leadership

Strong medical leadership is reported to exist within the heart centres. Each of the heart centres has one or more cardiologists or cardiothoracic surgeons who are active in outcome measurement, data analysis and outcome improvement initiatives. However, these physicians are not always in formal leadership positions.

Organizational context (5): infrastructure

Insufficient data infrastructure, data management, and data quality are seen as the largest barriers to realizing outcome-based improvements. In this phase, resources are invested in solving this problem. All heart centres expressed the ambition to realize automatic extraction of data, automatic visualization of outcome measures—including patient reported outcome measures (PROMs)—and real-time insight into outcomes. None of the heart centres have realized this yet, partly due to the introduction of the new Electronic Health Records.

Organizational context (6): staffing

Most heart centres mentioned time of physicians as an important resource to realize outcome-based quality improvement. However, most centres do not have dedicated time available for physicians to work on outcome analysis and outcome-based improvement initiatives.

Organizational context (7): skills

All hospitals have access to data analysts and epidemiologists to extract and analyse outcome data. Some hospitals had specifically trained members of their staff with regard to VBHC and/or steering on outcomes.

Discussion

The results show that, with regard to outcome-based quality improvement and VBHC, the focus of the heart centres is on collecting data and monitoring the outcomes. The actual use of outcomes to improve quality of care is limited. However, the interviewees—both physicians and non-medical management—expressed the ambition to realize an outcome-based quality improvement cycle. There are several barriers to realizing this.

First, insufficient data infrastructure is mentioned as the main barrier to successful outcome-based quality improvement. This barrier is widely recognized in the VBHC community; developments in this area are ongoing and improvements can be expected in the coming years.[20]

A second significant barrier seems to be that the lack of a systematic approach to identifying and implementing improvement initiatives. According to Porter,[1] measuring outcomes is an essential step in implementing VBHC. However, VBHC does not give any guidance on how to use outcome measurement as a starting point for quality improvement. Benchmarking of outcomes is suggested, but how this supports improvement projects in practice remains unclear.[12] Sound methodology is needed in the hospitals with regard to the interpretation of differences in outcomes (i.e. when is a difference relevant and should a project to improve be initiated) and the research and selection of changes in processes in healthcare to improve the outcomes.

The third barrier concerns governance. The roles and responsibilities regarding outcome improvement are not yet formalized. Clear roles and responsibilities are often mentioned as preconditions for successful quality improvement and implementation of PDSA cycles.[21,22] This may require only minor efforts, as outcome monitoring for quality improvement is relatively new and the physicians taking on this challenge are not always in formal leadership positions. However, a more fundamental issue seems to be that outcome measures are defined for medical conditions (e.g. coronary artery disease) and several specialties are involved in and responsible for these outcomes. This is where the implementation of outcome-based quality improvement directly relates to Porter's[1] work on VBHC and his proposal to organize care in Integrated Practice Units (IPUs). The heart centres currently seem to be characterized by cooperation between disciplines, but not full integration and multidisciplinary steering on outcomes covering the full cycle of care. Specialties within the heart centres are moving towards more integration, openness, and standardization of quality management. However, it is not yet clear whether IPUs are needed to realize successful outcome-based quality improvement, and to what extent involvement of other healthcare providers (e.g. general practitioners) is essential.

A fourth barrier is the lack of the implementation of outcomes within the hospital strategy, policy documents, and planning and control cycle. This is not yet realized as the focus is mainly on mandatory process or structure indicators from the Health Care Inspectorate or health insurance companies. Apart from the task of implementing outcome measures in dashboards, performance reports, annual plans etc., the implementation of outcomes in the hospital's strategy will require a shift in thinking for most hospitals. The study shows that typically hospitals initiate quality improvement efforts when they do not reach a certain norm. This norm is determined by external stakeholders, such as the inspectorate. However, with the growing focus on outcome measures, hospitals seem to be moving from using quality measures in a reactive manner to a situation where outcome measures are used to set internally defined quality targets.

Little research has been conducted on how to use outcome measures as part of effective quality improvement in hospitals. Earlier research indicates that providing feedback on health outcomes at the level of the team involved in care delivery for a medical condition is important.[14,23] The first publications on VBHC implementation indicate that comparing outcomes between institutes helps centres identify improvement potential. Defining concrete goals on outcomes as a part of the hospital strategy might support this. However, the most difficult step seems to be identifying what should be changed in the care delivery process to improve outcomes. One approach is to use the available data to directly identify and prove the cause for worse (or better) performance in outcomes. This is perhaps the ideal approach, and it is used for instance at the Martini Klinik.[15] However, so

far few such examples are available and in many cases this approach is not possible due to limited statistical power (smaller patient groups) or a simple lack of data. Moreover, evaluation of outcomes at the level of individual patient files is an often used methodology. Observations in Dutch cardiac care suggest that this strategy rarely leads to initiation of improvement projects, as negative outcomes can often be explained or are acceptable due to conditions of the patient. Experience in Dutch cardiac care seems to indicate that a more viable approach is data-driven selection and testing of good practices.[12,13] Here, outcome data and process analyses are used to define hypotheses regarding their interrelation. In parallel, discussions between healthcare professionals of these centres in combination with literature review etc. are used to formulate and evaluate improvement projects.

Limitations

This study has a number of limitations. First, the aim of this study was to attain insight into the current state of outcome-based quality improvement in cardiac patient care in the Netherlands. However, the six centres that participated in the study volunteered to do so, and might therefore, not be representative due to potential positive bias towards the subject matter. Second, the work culture in participating centres was only assessed by interviews and questionnaires, none of which were anonymous. More specific and anonymous questionnaires regarding the culture in these centres may be warranted in the future.

Conclusions

Even though heart centres in the Netherlands are measuring health outcomes for the majority of cardiac diseases, the actual use of these outcomes to improve quality of care remains limited. Defining goals related to outcomes and adopting a methodology for selecting improvement projects seem to be important next steps.

The model used, which combines the four steps of outcome-based quality improvement with the seven elements of the organizational context, was able to clearly pinpoint both strong and weak points in the development of these heart centres. We recommend the use of this model in practice—also in other areas of healthcare—by healthcare provider management.

Supplementary material

Supplementary material is available at *European Heart Journal – Quality of Care and Clinical Outcomes* online.

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